

## ON TWO DEEP-LEVEL DEPOSITS OF NEWER PLEISTOCENE IN SOUTH AUSTRALIA.

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The majority, if not all, of the low-level tracts fringing our coastline is generally known to be occupied by recent marine accumulations, indicating an elevation of about 12 to 14 ft. around St. Vincent's Gulf, and thence westward to Fowler's Bay (see Trans. R. Soc., S. Aust., II, 1879, pp. lxxvii-lxix and 114; IV, 1881, p. 45; and XIII, 1890, pp. 172 and 181). In the South-East, stretching from Lake Alexandrina to the plateau of the Mount Gambier limestone, similar deposits of recent marine shells underlay this extensive paludinal area (see Woods, "Geol. Obs.," pp. 183 *et seq.*).

With the exception of the Port Creek shell-limestone (see Trans. Roy. Soc., S. Aust., X, 1888, p. 31), which extends from 18 to 26 ft. below high tidemark, no tangible evidences of deep-seated deposits of a like nature have been brought to scientific notice, though a passing reference to such an occurrence in the Tintinara bore was made at my instigation by Mr. E. V. Clark (Trans. Roy. Soc., S. Australia, XX, p. 115). The desirability of publishing particulars of the indications of recent marine deposits at considerable depths in the Port Pirie bore has influenced me in furnishing the data which fix a like age for the chief fossiliferous beds passed through in the Tintinara bore, though more than a decade has passed since the completion of that work, more especially so as my analyses extend the depth of the newer deposits for a further depth of 90 ft. than that stated by Mr. Clark.

### TINTINARA BORE.

This bore was executed by our Department of Water Supply. Samples of the beds passed through and explanatory manuscript formed part of an exhibit staged by the Hydraulic Department in the Jubilee Exhibition held at Adelaide in 1887. This exhibit is now in the museum of our School of Mines, and the samples from Tintinara have been critically examined by me.

The Tintinara bore is located in the Ninety-mile Desert in near proximity to a station of that name on the railway line connecting Adelaide and Melbourne. Its site is sixty-two feet above sea level, and the main fossiliferous deposits extend in depth from 60 to 100 feet, though marine shells appear at 26 feet and at 154 to 244 ft. The deposits to 154 ft. in depth consist essentially of loose shell debris, with varying admixture of sand; viewed as a whole, the shell debris is, by its nature and the species of molluscs represented, analogous to shell banks which occur between tide-marks on sheltered beaches of to-day, such for example as Hardwicke Bay.

The majority of the species, though not living between tide-marks, are those either frequent or not uncommon among the accumulation of shells on many of our beaches. The accompanying list of species is based on the examination of about two pints of material, 'belonging to the School of Mines, in three equal parts from 60 to 70, 70 to 80, and 90 to 100 ft. in depth; and about half-a-pint in the aggregate from depths ranging from 154 to 244 ft. received from the Conservator of Water. All the commoner species occur at all the depths to 100 ft., so that a record of the position of the rarer forms was not considered necessary, but I have added the occurrences below that depth in support of my contention that the containing beds are Newer Pleistocene and not Eocene.

Some of the identifications in the subjoined list, either from the fragmentary, juvenile, or rolled condition of the specimens on which they have been based, are not certain though approximately correct; these are indicated in the list by a sign of doubt after the author's name.

All the determined species, as a result of comparison with authenticated specimens, are with three exceptions living in our seas. The exceptions are:—*Strigilla* sp., this is represented by very little more than the hinge-line of a medium-sized left valve and by a right valve, 6 by 5 mm.; there can be no doubt as to the generic location, but the incomplete outline of the fragment and the very juvenile size of the perfect valve do not permit with safety an identity with the only Australian species of the genus, *S. Senegalensis*, occurring in North Queensland (Port Douglas, ex Brisbane Museum). The very much finer and closer sculpture does not agree with that on an equal area of the umbonal region of the Queensland shell. A minute Erycinid, genus and species yet to be determined, and *Syrnola Jonesiana* are the other exceptions, both occur in abundance. These I cannot associate with any Australian species known to me either by actual specimens or figures.

## SUMMARY OF STRATA

Passed through in the Tintinara Bore. (Surface 62 ft. above sea-level).

## RECENT (Terrestrial).

	Depth in Feet.	
Travertine, compact and rubbly ... ..	0 —	24

## NEWER PLEISTOCENE (Marine).

Sand (a few marine shells) ... ..	24 —	26
Yellow and grey sands (shells very abundant)	26 —	154
White friable calcareous silt (apparently comminuted polyzoal debris, shells rare)	154 —	160
Black clay (with scattered shells) ... ..	160 —	244

## EOCENE (Marine).

Blackish-brown sand (with numerous fossils)	244 —	253
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Total thickness of the Newer Pleistocene beds is 220 ft., extending in depth from 38 ft. above sea level to 182 ft. below it.

The calcareous silt (154-160 ft.) was regarded by Mr. Clark as the equivalent of the polyzoal limestone of our Eocene, but, as may be gathered from my List, the under-laying black clay (160-244 ft.) contains the same species of mollusca as occur in the beds over-laying it.

To account for a few Eocene fossils in the washings from the material labelled 220-244 ft., there has been some reconstruction of the Eocene-surface or the basal portions of the black clay and the upper-most portion of the Eocene sand-bed have been accidentally mixed in the process of boring. But recognition of their respective sources is easy by the fact that the Pleistocene-shells show lustre in contrast with the dark-brown colour and opacity of the tests of the Eocene-species. The *Bankivia* from 220-244 ft. still retain their colour-markings, and the *Erycinid* bivalve is quite pellucid.

## LIST OF SPECIES.\*

[The prefixed asterisk denotes abundance.]

- Purpura textiliosa*, Lamarck.
- \**Nassa monile*, Kiener. Also 145-154 ft.
- Marginella muscaria*, Lamarck.
- Marginella muscaria*, var. minor. At 220-244 ft.
- \**Marginella turbinata*, Lamarck. Also 220-244 ft.
- Columbella semiconvexa*, Lamarck.
- \**Neverita conica*, Lamarck.
- Neverita sagittata*, Menke?
- Bittium estuarinum*, Tate.
- \**Syrnola Jonesiana*, Tate.

\*Examples are included in the Palæontological Collection at the Museum of the School of Mines.

- Rissoia (Sabanæa) Tasmanica, *Ten.-Woods*.  
 Calliostoma Allporti, *Ten.-Woods*.  
 Trochocochlea constricta, *Lamarck*.  
 \*Bankivia fasciata, *Menke*. Also to 244 ft.  
 Adelaetæon casta, *A. Adams*.  
 Volvulella rostrata, *A. Adams*.  
 Corbula tunicata, *Hinds*.  
 Corbula scaphoides, *Hinds*. At 180-200 ft.  
 \*Mactra rufescens, *Lamarck*.  
 Mesodesma elongata, *Deshayes*.  
 Mesodesma erycinæa, *Lamarck*.  
 Strigilla sp., . Also 145-154 ft.  
 Rupellaria mitis, *Deshayes?* Also 145-154 ft.  
 Chione undulosa, *Lamarck?*  
 \*Gen. et sp. Erycinidæ (not determined). Also 220-244 ft.  
 Carditella infans, *E. A. Smith?*  
 \*Nuculana crassa, *Hinds*. Also to 244 ft.  
 Limopsis Forskali, *A. Adams*.  
 Magasella Cumingi, *Davidson*. At 154-160 ft.

### PORT PIRIE BORE.

Operations at this bore were suspended at the date of preparation of this communication, after having passed through to a depth of 574 ft. of incoherent deposits, and a further depth of 61 ft. in siliceous clay-shales and limestones of Cambrian age. At the date of the reading of this paper the boring had been resumed, but with what object one is at a loss to understand, as previously a finality had been secured both from geological and economical standpoints. Samples of the beds passed through and a statement of their respective thicknesses have been obligingly placed in my hands by the Conservator of Water. From these data the following descriptive tabular schedule of the boring has been drawn up:—

Surface-level 14 ft. above low water-mark.

#### NEWER PLEISTOCENE.

	Depth in feet.	
Light blue clay ... ..	—	30
Mottled clayey gritty sand. Marine shells	30	90
Reddish sub-angular gritty sandy clay. Marine shells ... ..	90	110
Light grey calcareous silt, slightly argillaceous, with <i>Plecotrema ciliatum</i> ...	110	136
Brown clay with included subangular siliceous and calcareous grit. Marine shells	136	150
Mottled (red and gray) gritty clay. Salt water ... ..	150	178
Red-yellow sand or sandrock, consisting of coarse moderately abraded grains ...	178	180
Light red and cream colored mottled clay	180	276

Yellowish grey sandy clay. A little salt water ... ..	276	—	290
Very fine grained, yellow, sand-rock. Brackish water ... ..	290	—	360

## INFRA EOCENE ?

Fine grained, white, sand-rock, colored black by carbonaceous matter ... ..	360	—	455
Fine grained, white, sand-rock, colored black by carbonaceous matter. With iron pyrites ... ..	455	—	485
Brown, slightly argillaceous, sand-rock (color discharged on heating) ... ..	485	—	490
Brown and black bituminous clayey sand-rock ... ..	490	—	527
Fine grained clayey sand and sandy clay, with bituminous stains. Stock water	527	—	560
Sand with lignite fragments ... ..	560	—	574

## CAMBRIAN.

Siliceous shales and limestones ... ..	574	—	641
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Washings for macro-organisms have yielded the following results :—

Depth of 50-ft.—*Cerithium tenue*, Sowb.; and *Clanculus Dunkeri*, Phil.

Depth of 70-ft.—*Cerithium tenue*.

Depth of 130-ft.—*Plecotrema ciliatum*, Tate.

Depth of 150 to 170-ft.—*Cerithium tenue*; *Diala lauta*, A. Adams; *Odontostomia Angasi*, Tryon; *Cyclostrema Tatei*, Angas; *Pseudoliotia micans*, var. *simplicior*, Tate; *Clanculus Dunkeri*; and *Utriculus eumicrus*, Crosse.

[NOTE.—The majority of the foregoing species has been presented to the Museum of the School of Mines.—R.T.]

The species and individuals are few in number; but, considering the very small bulk of the material under analysis, they are proportionately rich. All, with one exception, are living in South Australian waters, and are commonly cast-up on our shell beaches. The exception is a varietal form of a somewhat common littoral shell—*Cyclostrema micans*.

Passing upwards from the Cambrian bed-rock, there are 314 ft. of unfossiliferous beds, more or less carbonaceous. These indicate a land-accumulation. Whether or not, they are virtually contemporaneous with the overlying marine-beds, or are on the same horizon as similar beds passed through in the Kent Town-bore,\*

\* Trans. Roy. Soc., S. Aust., V, 1882, p. 43; and XIII, 1890, pl. 4.

which underlay Marine Eocene, it is impossible to say. The succeeding 182 ft. of sandy and clayey beds, though unfossiliferous, have so much the character of the overlying strata with marine shells that they may be reasonably regarded as forming part of the same series. The chief fossiliferous beds range between 90 and 150 ft., but in the midst of them, at about 130 ft., is a band of calcareous silt charged with *Plecotrema ciliatum* in an excellent state of preservation. This pulmoniferous mollusc is living at extreme high tide-mark in the marine marshes abutting on the Port Creek, whilst the fine calcareous silt is analogous to the shell-travertine which delimits the margin of an upraised Pleistocene sea-bed, extending from Glenelg via Dry Creek to beyond Virginia. This ancient silt with *Plecotrema* must, therefore, at the period of its accumulation have been at the line of junction of sea and land, and is indicative of an actual depression of 130 ft. below high water-mark. The associated beds, from 30 to 150 ft. in depth, are, from their contained organic remains, shore-line accumulations, and the total amount of depression evidenced thereby is a few feet less than 150 ft. below high water-mark.

#### DESCRIPTIONS OF NEW SPECIES.

##### ODONTOSTOMIA JONESIANA, *Tate*, 1898.

Shell narrowly pyramidal, a little more than three times as long as wide, shining-white and smooth. Spire-whorls eight in a length of six millimetres, of moderately rapid increase, flat, separated by a well-defined linear suture. Last whorl with a regularly convex base; aperture pyriform, with a stout elevated plait at the origin of the columella, inner front angle of aperture slightly effuse and thickened with a slightly reflexed edge. Length, 6·25, vix; breadth, 2·0, vix, mm.

If *Syrnola* is a valid genus, then the present species belongs thereto. Among Australian species known to me by actual specimens it has the following alliances. It is narrower than *S. jucunda* and broader than *S. tineta*, but differs from both in its longer aperture and the far-backward position of the columella-plait; in respect of its apertural characters, it resembles *S. infrasulcata*, mihi, which is, however, a robust shell and has a sculptured body-whorl.

The species-name is in compliment to Mr. J. W. Jones, Conservator of Water, whose continued interest in the promotion of stratigraphical and palæontological investigations is abundantly evinced in the present communication.

PSEUDOLIOTIA MICANS, A. Adams, VAR. SIMPLICIOR, Tate, 1898.

*Cyclostrema micans* is the type of a new genus, *Pseudoliotia* which I propose to establish. The present variety differs by the acute axial costæ, which do not form nodulations on the spiral carinæ. In consequence, the periphery appears markedly truncate with a deep concave sulcus between the two peripheral keels. Nevertheless, the normal forms show some variation in the density of the nodulation and by decrescence of that character would graduate into the variety here described. Unfortunately only one example (an adult) was found, and that of 2 mm. diameter. This size is much smaller than usual, which ranges up to 4 mm., yet it is not smaller than a micromorph, which occurs abundantly at Port Western, Victoria, or than *Liotia speciosa*, Angas, which is conspecific.

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